3.0
QUALITY ASSURANCE OBJECTIVES

Quality assurance (QA) is defined as the ability to assure that the field and laboratory activities are performed correctly, and that the data can be confidently used to make decisions. The chemical analysis data to be obtained under this QAPP will be utilized in evaluating the nature, extent, fate and transport of contaminants within the Passaic River Study Area and for use in the baseline risk assessment. The most stringent use of these data is anticipated to be the risk assessment. Therefore, the quality assurance and quantitation limits required for risk assessment purposes are considered adequate for the other anticipated uses of these data. The data will be used to evaluate the potential risks of chemicals in sediments to human and ecological receptors. For that reason, the quantitation limits have been evaluated with respect to conservative screening guidelines that are often used by EPA as preliminary screening guidelines for Superfund sites.

Ecological sediment guidelines that are often used as screening criteria by EPA at Superfund sites include the EPA proposed sediment quality criteria (SQC) that are normalized to organic carbon in sediments, and the NOAA ER-M (effects-range median) and ER-L (effects-range low) values that are reported on a dry weight basis. The SW-846 quantitation limits are sufficiently low enough to allow comparisons to the vast majority of these sediment quality guidelines. For a few chemicals, mainly some individual PAHs and pesticides, the SW-846 quantitation limits are somewhat higher than the NOAA ER-L values, particularly since the quantitation limits are reported on a wet weight basis and, therefore, will be somewhat higher on a dry weight basis.

In the screening-level ecological risk assessment, the following guidelines will be used for chemicals that (a) have sample quantitation limits (on a dry weight basis) that are

greater than the respective NOAA ER-L value and, (b) are detected in some, but not all, of the sediment samples from the Site. For screening purposes and to be conservative, in samples where these chemicals are non-detect, the sediment concentration will be assumed to be equal to the quantitation limit and, therefore, to exceed the ER-L. This will eliminate any possibility of underestimating the risk from these chemicals, by automatically including them in the risk analyses.

To evaluate the adequacy of the SW-846 methods for providing data to support the human health risk assessment, the quantitation limits have been compared with conservative screening-level risk-based concentrations (RBCs) developed by EPA (Region III) for ingestion of industrial soils. The soil/sediment ingestion exposure pathway was utilized for this analysis because it is the only pathway for which conservative risk-based screening criteria have been developed. The Region III RBCs were used because they were developed based on the most conservative national EPA risk assessment guidelines for soil ingestion; i.e., they correspond to concentrations in soils that are associated with a target cancer risk of 1×10^{-6} or noncancer hazard index of 1 given standard default EPA exposure assumptions and EPA-derived toxicity values.

For chemicals believed to have both carcinogenic and noncarcinogenic properties, the lower of RBCs calculated for both endpoints is used as the RBC. Although the risk-based concentrations were developed for ingestion of soils, their use for the purpose of screening sediment quantitation limits is highly conservative. Incidental ingestion of sediments would involve much lower contact rates, exposure frequency, and exposure duration than exposure to industrial soils. Thus, RBCs based on soil ingestion will be much lower than RBCs based on sediment ingestion.

Based on comparisons to the RBCs, the SW-846 detection limits are more than adequate for the chemicals of interest for the Site. Given the conservative nature of these

comparisons, it is clear that the proposed quantitation limits will be sufficiently low to support the human health and ecological risk assessment.

Samples to be analyzed and the analyses to be specified for each sample are given in the FSP.

3.1 ANALYTICAL METHODS AND QUANTITATION LIMITS

In accordance with Section XI, Paragraph 71 of the AOC, the QA/QC limits for accuracy and precision specified in this QAPP are based on those set forth in "Test Methods for Evaluating Solid Wastes, SW-846" (SW-846). For volatile organics, semivolatile organics, pesticide/polychlorinated biphenyls (PCBs), and chlorinated herbicides, the accuracy and precision limits are those specified in the SW-846 analytical methods. The accuracy and precision limits for metals and cyanide discussed in Section 3.3.7 include all those limits specified in SW-846 Methods 6010A, 7000A, 9010A, and 9012. The accuracy and precision limits for the polychlorinated dibenzo-p-dioxin/polychlorinated dibenzofuran (PCDD/PCDF) analyses are specified in Section 3.3.6. As SW-846 does not contain analytical methodologies or accuracy and precision limits for total extractable petroleum hydrocarbons (TEPH), total dissolved solids (TDS), and total suspended solids (TSS), the limits for accuracy and precision will be those specified below.

The analytical methods to be utilized under this QAPP are specified in Table 7-1. The target analytes for each of the specified analytical methods and the required quantitation/detection limits for each of the target analytes are listed in Tables 3-1 through 3-8.

With the exception of the PCDD/PCDF, metals and cyanide analyses, the laboratory must demonstrate that the reporting sample quantitation limit (SQL) for each analyte

on a "clean" matrix (i.e., blank) is less than or equal to the required quantitation limits listed in Tables 3-1 through 3-5 and Table 3-8. The laboratory's SQL for each analyte must be 3 to 5 times the laboratory's method detection limit (MDL) for that analyte. No analytical results shall be reported as detectable if calculated concentrations are less than the laboratory's SQL.

For the metals and cyanide analyses, the laboratory's instrument detection limit (IDL) on a "clean" matrix for an analyte must be less than or equal to the required detection limit for that analyte listed in Table 3-7. The laboratory will report non-detects for metals at the IDL. The detection limits for PCDDs/PCDFs are sample specific per the analytical method. The detection limits on a "clean" matrix must be less than the detection limits listed in Table 3-6.

Detection limits for PCDD/PCDF non-detect results are to be calculated in accordance with the following procedures:

Calculate a sample-specific estimated detection limit (EDL) for each 2,3,7,8-substituted congener for which the Selected Ion Current Profile indicated that either peak was not found to be present with a signal to noise ratio greater than 2.5:1.

Use the equation below to perform the EDL calculations:

For Soil/Sediment:

$$EDL = \frac{2.5 \times Hx \times Qis}{His \times RR \times W}$$

For Water/Liquid:

$$EDL = \frac{2.5 \times Hx \times Qis}{His \times RR \times V}$$

Where:

Hx = The peak height or area of the noise of the quantitation ion of the 2,3,7,8-substituted congener of interest.

His = The peak height or area of the quantitation ion of the appropriate internal standard.

Qis, RR, W, and V are the quantity of internal standard, the relative response, the dry weight of sample, and the volume of sample, respectively.

Calculate an Estimated Maximum Possible Concentration (EMPC) for 2,3,7,8-substituted congeners that had S/N ratios for the quantitation and confirmation ions greater than 2.5:1 but for which interferences caused the result to fail some other qualitative identification criterion.

Use the equation below to perform the EMPC calculations:

For Soil/Sediment:

$$EMPC = \frac{Ax \times Qis}{Ais \times RR \times W}$$

For Water/Liquid:

$$EMPC = \frac{Ax \times Qis}{Ais \times RR \times V}$$

Where:

Ax = Area of the quantitation ion for the 2,3,7,8-substituted congener of interest.

Ais = Area of the quantitation ion for the labelled compound.

Qis, RR, W, and V are above

NOTE: For the calculations of EMPC the lower area of the quantitation or confirmation ion is used. The use of lower EMPC, will more accurately reflect the possible concentration of the PCDD/PCDF.

3.2 DATA QUALITY PARAMETERS

All data are potentially subject to some uncertainty and error as they are generated through sampling, analysis, and reporting. Control and recognition of errors is important in assessing data quality and preparing technical reports. The impact of data uncertainty and errors on the project can be reduced in two ways: 1) through quality control (QC) measures, and 2) through documentation of the quality or nature of data error or uncertainty for the data generated.

In order to evaluate whether the analytical data are consistent with the objectives of each task, an assessment of the performance of five data quality parameters must be performed. These data quality parameters are precision, accuracy, completeness,

representativeness, and comparability and are discussed in this section. Quantitative limits for acceptable precision, accuracy, and completeness are also included.

3.2.1 Precision

Precision is the measure of variability between individual sample measurements of the same property under prescribed similar conditions. The measurement of precision is made through the use of replicate samples (also known as sample splits) taken at regular, specified intervals. Replicate samples are collected in the field (homogenized before being split into two distinct samples) or prepared during laboratory analysis (laboratory duplicates) and are expected to contain identical contaminant concentrations. Therefore, any variability in the reported analyses is attributable to variability introduced by sampling, handling, or analytical procedures. Analysis of field replicate samples provides an estimate of overall sampling and analysis precision. Frequency of collection of field duplicate samples is discussed in Section 9.0. Analysis of laboratory duplicates provides an estimate of analytical precision. The precision of field replicate analyses (field duplicates) and laboratory replicate analyses is expressed as relative percent difference (RPD). Section 12.1.2 of this QAPP details the formula for calculating RPD.

3.2.2 Accuracy

Accuracy is a measure of the bias in a system and can be defined as the degree of agreement between a measurement and an accepted reference or true value. The exact bias of a system is never known since the true values are not accessible. However, inferences can be drawn from an evaluation of various analyses. The accuracy or bias of a laboratory analysis is evaluated by analyzing standards of known concentration both before and during sample analysis. Bias is also evaluated by spiking a sample with a known quantity of a chemical and measuring its actual, versus expected, recovery in analysis. Similarly, any bias introduced by laboratory contaminants are detected during

blank analysis. Analytical QC samples which will be used to control analytical accuracy are discussed in Section 9.0. Analytical accuracy is also measured through procedures detailed in the SOP of most analytical methods. Section 12.1.2 of this QAPP details the formula for calculating accuracy as percent recovery (%R) of spiked samples.

Accuracy in regard to sampling procedures is also evaluated through use of blanks. For example, field blanks or equipment rinsate blanks demonstrate any bias introduced by contaminated sampling equipment, sample containers, or sample handling. Section 9.0 discusses QC samples collected in the field to be used to control the accuracy of the data.

3.2.3 Representativeness

Representativeness is the degree to which a set of data accurately represents the characteristics of a population, parameter conditions at a sample point, or an environmental condition. Representativeness is evaluated by collecting QC samples and performing all sampling in compliance with appropriate procedures. Sampling SOPs or detailed descriptions of sampling procedures are found in the FSP.

3.2.4 Completeness

Field completeness is a measure of the many ways to define completeness as defined here overall number of samples planned to be collected as specified in the FSP compared to the number of samples that are received in acceptable condition by the laboratory(ies). Analytical completeness is a measure of the number of overall Accepted Analytical Results (including estimated values) compared to the total number of analytical results requested on samples submitted for analysis after review of the analytical data. Both the overall field completeness and overall analytical completeness goals are 80% as calculated by the formulae in Section 12.1.3.

If the overall field completeness and/or analytical completeness goals are not met, the Contractor Project Manager in consultation with the Contractor QA/QC Officer and other senior project personnel will decide if the missing data are crucial or necessary to meeting project requirements. If it is decided that the data are insufficient, additional field samples will be collected and analyzed.

3.2.5 Comparability

Comparability expresses the confidence with which one set of data can be compared to another measuring the same property. Data can be compared to the degree that their accuracy, precision, and representativeness are known and documented. Data are comparable if QC measures such as collection techniques, measurement procedures, methods, and reporting units are equivalent for the samples within a sample set. Data subject to QA/QC measures are deemed more reliable and, therefore, more comparable, than data generated without such measures.

3.3 ACCURACY AND PRECISION LIMITS

The laboratory limits for accuracy (as measured by the percent recoveries for surrogate spike compounds, matrix spike/matrix spike duplicate analyses (MS/MSD), and laboratory control sample (LCS) analyses) and precision (as measured by RPD between laboratory duplicate analyses and MS/MSD analyses) will be either the laboratory control limits based on historic data calculated as specified in the analytical methods or the limits specified in the subsections below, whichever limits are more stringent. For convenience of use, the extraction and analytical methods referenced below are reproduced in Appendices A to K. See Table of Contents for a complete listing of Methods in Appendixes. If these limits are not met, the laboratory will follow the actions specified in the analytical method. The accuracy and precision limits used for

evaluating the quality and useability of the data are specified in Section 8.0, Data Reduction, Validation and Reporting.

3.3.1 Volatile Organics

The limits for accuracy and precision for volatile organics are given in Tables 7 and 8 of the analytical method (Method 8260 in Appendix A) for the MS/MSD analyses and in Table 9 for surrogate recoveries.

3.3.2 Semivolatile Organics

The limits for accuracy and precision for semivolatile organics are given in Table 6 of the analytical method (Method 8270A in Appendix B) for the MS/MSD analyses and in Table 8 for surrogate recoveries.

3.3.3 Polynuclear Aromatic Hydrocarbons (PAHs)

The limits for accuracy and precision for PAHs are given in Table 6 of the analytical method (Method 8270A in Appendix B) for semivolatile organics for the MS/MSD analyses and in Table 8 for surrogate recoveries.

3.3.4 Pesticides/PCBs

Limits for accuracy (%R) for LCS are 80-120 percent, as stated in the analytical method. Limits for accuracy of surrogate recoveries are calculated by the laboratory as specified in Method 8000A.

3.3.5 Chlorinated Herbicides

The limits for accuracy and precision for chlorinated herbicides are given in Table 3 of the analytical method (Method 8150A in Appendix D) for the MS/MSD analyses. Limits for accuracy of surrogate recoveries are calculated by the laboratory from historic data as specified in Method 8000A. Limits for accuracy for LCS are 80-120 percent.

3.3.6 PCDD/PCDF

The limits for the initial precision and accuracy (IRP), the ongoing precision and accuracy (OPR), the calibration verifications (VER), and the internal standard recovery for the PCDD/PCDF analysis are given in Table 7 of the analytical method (Method 1613A in Appendix E). The percent recovery limits for MS/MSD analyses are 60 to 140 percent.

3.3.7 Metals and Cyanide

The limits for accuracy (%R) for metals analysis will be 80 to 120 percent for arsenic, selenium, thallium, lead and mercury 85 to 115 percent for cyanide, and 90 to 110 percent for all other metals for the VER as specified in SW-846 Methods 7000, 9010A, and 6010, respectively. The accuracy (%R) limits for LCS will be 75 to 125 percent for aqueous samples and the commercial supplier limits based on round robin studies for a solid LCS. The accuracy and precision limits for the matrix spike and laboratory duplicate (MS/duplicate) analyses will be %R of 75 to 125 percent and an RPD of 20% for aqueous samples and 35% for soil/sediment samples. Since SW-846 does not set any limits for post-digestion spike recoveries for atomic absorption analyses, these limits will be 85 to 115% as specified in the Contract Laboratory Program SOW for Inorganics Analysis (ILM 02.0).

3.3.8 Total Extractable Petroleum Hydrocarbons

The limits for accuracy are %R between 75 to 125 percent for VER and %R between 40 to 14%R for surrogates, LCS, and MS/MSD analyses. The limit for precision is 20% RPD for aqueous samples and 35% RPD for soil/sediment samples for MS/MSD analyses.

3.3.9 Other Analytes

The limits for accuracy and precision for other analyses, except radiochemical analyses, are 50 to 150 %R and an RPD between duplicate analyses of 20% for aqueous samples and 35% for soil/sediment samples.

TABLE 3-1

QUANTITATION LIMITS FOR VOLATILE ORGANICS BY GC/MS[1,2]

Compounds	Water (Fg/L)	Low Soil/Sediment (Fg/kg)
Chloromethane	10	10
Bromomethane	10	10
Vinyl chloride	10	10
Chloroethane	10	10
Acetone	10	10
Carbon disulfide	10	10
1,1-Dichloroethene	10	10
1,1-Dichloroethane	10	10
1,2-Dichloroethene (total)	10	10
Dichloromethane	10	10
Chloroform	10	10
1,2-Dichloroethane	10	10
2-Butanone	10	10
1,1,1-Trichloroethane	10	10
Carbon Tetrachloride	10	10
Bromodichloromethane	10	10
1,2-Dichloropropane	10	10
cis-1,3-Dichloropropene	10	10
Trichloroethene	10	10
Dibromochloromethane	10	10
1,1,2-Trichloroethane	10	10
Benzene	10	10
trans-1,3-Dichloropropene	10	10
Bromoform	10	10

TABLE 3-1
(Concluded)

Compounds	Water (Fg/L)	Low Soil/Sediment (Fg/kg)
4-Methyl-2-pentanone	10	10
2-Hexanone	10	10
Tetrachloroethene	10	10
Toluene	10	10
1,1,2,2-Tetrachloroethane	10	10
Chlorobenzene	10	10
Ethyl benzene	10	10
Styrene	10	10
Xylenes (total)	10	10

[1] Specific quantitation limits are highly matrix-dependent. The laboratory's sample quantitation limit (SQL) must be 3 to 5 times the laboratory's MDL for that analyte, and the laboratory's SQL's must be equal to or lower than the quantitation limits listed herein. Quantitation limits listed for soil are based on wet weight. Quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

[2] See Table 7-1 for analytical methods.

TABLE 3-2

QUANTITATION LIMITS FOR SEMIVOLATILE ORGANICS BY GS/MS[1,2]

Compounds	Water (Fg/L)	Low Soil/Sediment (Fg/kg)
Phenol	10	330
bis (2-Chloroethyl)ether	10	330
2-Chlorophenol	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
1,2-Dichlorobenzene	10	330
2-Methylphenol	10	330
2,2'-oxybis(1-chloropropane)	10	330
4-Methylphenol	10	330
N-Nitroso-di-n-dipropylamine	10	330
Hexachloroethane	10	330
Nitrobenzene	10	330
Isophorone	10	330
2-Nitrophenol	10	330
2,4-Dimethylphenol	10	330
bis(2-Chloroethoxy)methane	10	330
2,4-Dichlorophenol	10	330
1,2,4-Trichlorobenzene	10	330
Naphthalene	10	330
4-Chloroaniline	10	330
Hexachlorobutadiene	10	330
4-Chloro-3-methylphenol	10	330
2-Methylnaphthalene	10	330
Hexachlorocyclopentadiene	10	330
2,4,6-Trichlorophenol	10	330
2,4,5-Trichlorophenol	25	800
2-Chloronaphthalene	10	330
2-Nitroaniline	25	800
Dimethylphthalate	10	330
Acenaphthylene	10	330
2,6-Dinitrotoluene	10	330
3-Nitroaniline	25	800
Acenaphthene	10	330
2,4-Dinitrophenol	25	800
4-Nitrophenol	25	800
Dibenzofuran	10	330
2,4-Dinitrotoluene	10	330
Diethylphthalate	10	330
4-Chlorophenylphenyl ether	10	330

TABLE 3-2
(Concluded)

Compounds	Water (Fg/L)	Low Soil/Sediment (Fg/kg)
Fluorene	10	330
4-Nitroaniline	25	800
4,6-Dinitro-2-methylphenol	25	800
N-nitrosodiphenylamine	10	330
4-Bromophenylphenyl ether	10	330
Hexachlorobenzene	10	330
Pentachlorophenol	25	800
Phenanthrene	10	330
Anthracene	10	330
Carbazole	10	330
Di-n-butylphthalate	10	330
Fluoranthene	10	330
Pyrene	10	330
Butylbenzylphthalate	10	330
3,3'-Dichlorobenzidine	10	330
Benzo(a)anthracene	10	330
Chrysene	10	330
bis(2-Ethylhexyl)phthalate	10	330
Di-n-octylphthalate	10	330
Benzo(b)fluoranthene	10	330
Benzo(k)fluoranthene	10	330
Benzo(a)pyrene	10	330
Indeno(1,2,3-cd)pyrene	10	330
Dibenz(a,h)anthracene	10	330
Benzo(g,h,i)perylene	10	330

[1] Specific quantitation limits are highly matrix-dependent. The laboratory's SQL must be 3 to 5 times the laboratory's MDL for that analyte, and the laboratory's SQL must be equal to or lower than the quantitation limits listed herein. Quantitation limits listed for soil are based on wet weight. Quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

[2] See Table 7-1 for analytical methods.

TABLE 3-3

QUANTITATION LIMITS FOR POLYNUCLEAR AROMATIC HYDROCARBONS[1,2] (PAHs) BY GC/MS

Compounds	Water (µg/L)	Low Soil/Sediment (µg/kg)
Naphthalene	10	330
2-Methylnaphthalene	10	330
2-Chloronaphthalene	10	330
Acenaphthylene	10	330
Acenaphthene	10	330
Phenanthrene	10	330
Anthracene	10	330
Fluoranthene	10	330
Pyrene	10	330
Benzo (a) anthracene	10	330
Benzo (b) Fluoranthene	10	330
Benzo (k) Fluoranthene	10	330
Benzo (a) pyrene	10	330
Dibenzo (a,h) anthracene	10	330
Benzo (g,h,i) perylene	10	330

[1] Specific quantitation limits are highly matrix dependent. The laboratory's SQL must be 3 to 5 times the laboratory's MDL for that analyte and the laboratory's SQL must be equal to or lower than the quantitation limits listed herein. Quantitation limits listed for soil are based on wet weight. Quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

[2] See Table 7-1 for analytical methods.

TABLE 3-4

QUANTITATION LIMITS FOR ORGANOCHLORINE PESTICIDES AND PCBs[1,2]

Compounds	Water (Fg/L)	Low Soil/Sediment (Fg/kg)
alpha-BHC	0.05	1.7
beta-BHC	0.05	1.7
delta-BHC	0.05	1.7
gamma-BHC (Lindane)	0.05	1.7
Heptachlor	0.05	1.7
Aldrin	0.05	1.7
Heptachlor epoxide	0.05	1.7
Endosulfan I	0.05	1.7
Dieldrin	0.10	3.3
4,4-DDE	0.10	3.3
Endrin	0.10	3.3
Endosulfan II	0.10	3.3
4,4-DDD	0.10	3.3
Endosulfan sulfate	0.10	3.3
4,4-DDT	0.10	3.3
Methoxychlor	0.50	17.0
Endrin ketone	0.10	3.3
Endrin aldehyde	0.10	3.3
alpha-Chlordane	0.05	1.7
gamma-Chlordane	0.05	1.7
Toxaphene	5.00	170.0
Aroclor-1016	1.0	33.0
Aroclor-1221	2.0	67.0
Aroclor-1232	1.0	33.0
Aroclor-1242	1.0	33.0
Aroclor-1248	1.0	33.0
Aroclor-1254	1.0	33.0
Aroclor-1260	1.0	33.0

[1] Specific quantitation limits are highly matrix-dependent. The laboratory's SQL must be 3 to 5 times the laboratory's MDL for that analyte, and the laboratory's SQL must be equal to or lower than the quantitation limits listed herein. Quantitation limits listed for soil are based on wet weight. Quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

[2] See Table 7-1 for analytical methods.

TABLE 3-5

QUANTITATION LIMITS FOR CHLORINATED HERBICIDES[1,2]

Compounds	Water	Soil/Sediment
2,4-D	12	240
2,4-DB	9.1	182
2,4,5-TP (Silvex)	5.0	100
2,4,5-T	5.0	100

[1] Specific quantitation limits are highly matrix dependent. The laboratory's SQL must be 3 to 5 times the laboratory's MDL for that analyte and the laboratory's SQL must be equal to or lower than the quantitation limits listed herein. Quantitation limits listed for soil are based on wet weight. Quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

[2] See Table 7-1 for analytical methods.

TABLE 3-6

REPRESENTATIVE DETECTION LIMITS FOR PCDD/PCDF PARAMETERS

PCDD/PCDF Parameters	CAS#	Detection Limits[1]	
		Water (pg/L)	Soil/Sediment/(pg/g)
2,3,7,8-TCDD	1746-01-6	10	1.0
1,2,3,7,8-PeCDD	40321-76-4	50	5
1,2,3,4,7,8-HxCDD	39227-28-6	50	5
1,2,3,6,7,8-HxCDD	57653-85-7	50	5
1,2,3,7,8,9-HxCDD	19408-74-3	50	5
1,2,3,4,6,7,8-HpCDD	35822-46-9	50	5
OCDD	3268-87-9	100	10
2,3,7,8-TCDF	51207-319	10	1.0
1,2,3,7,8-PeCDF	57117-41-6	50	5
2,3,4,7,8-PeCDF	57117-31-4	50	5
1,2,3,4,7,8-HxCDF	70648-26-9	50	5
1,2,3,6,7,8-HxCDF	57117-44-9	50	5
2,3,4,6,7,8-HxCDF	60851-34-5	50	5
1,2,3,7,8,9-HxCDF	72918-21-9	50	5
1,2,3,4,6,7,8-HpCDF	67562-39-4	50	5
1,2,3,4,7,8,9-HpCDF	55673-89-7	50	5